

Application No.: 09/990,474
Amendment Dated: October 20, 2003
Reply to Office Action of: July 18, 2003

MTS-2700US1

Remarks/Arguments:

Amendments

Claim 16, the only independent claim in the application, has been amended to more particularly point out and distinctly claim the subject matter that applicants regard as the invention. Claim 16 has been amended to indicate that the TiN film is the lower metal layer and that the upper metal layer is deposited directly on the TiN layer. If necessary, support for these amendments is found in Figure 1, on page 8, line 16, to page 9, line 11, and on page 10, lines 8-12. It is submitted that no new matter is introduced by these amendments. Entry of this amendment is respectfully requested.

PTO-892

Receipt of the missing PTO-892 is acknowledged with thanks.

First Rejection under 35 USC 103

Claims 11 and 16 to 21 were rejected as unpatentable over Arita, U.S. Patent 5,624,864 ("Arita") and Bailey, U.S. Patent 6,249,014 ("Bailey"). This rejection is respectfully traversed.

Arita discloses a semiconductor device having a capacitor and a manufacturing method thereof. Arita, Title. In Figure 7, an insulating layer 46 and a passivation layer 47 composed of silicon nitride are formed. Arita, column 7, lines 22-30. Charge characteristics of the capacitor 41 were measured after heating for 7 minutes at 380°C after forming passivation layer 47. Arita, column 8, lines 32-41.

The Office admits that Arita does not show heat-treating the TiN layer before depositing the upper Al layer. Office action of 7/18/03, page 2, lines 28-29.

According to the Office, referring to Figures 7 of Bailey, Bailey teaches heat-treating (anneal in step 838) the TiN layer before depositing the upper Al layer. Office action of 7/18/03, page 2, line 29, to page 3, line 3.

Referring to Figure 7A of Bailey, step 838 is described as "TiN Oxidation RTA Anneal" See, also, Bailey, column 8, line 52. As is well known, a TiN oxidation step converts the TiN layer to a TiO layer. Therefore, in Bailey, the upper layer is not deposited directly on a TiN layer. It is deposited on a TiO layer.

Further, because oxidation to a TiO layer precedes heat treatment, a TiO layer, not a TiN layer, is heat treated in the anneal step.

In contrast, applicants' claims recite heat-treating a TiN layer and depositing an upper metal layer directly on a TiN layer. Bailey does not disclose either of these features.

Bailey forms the TiO layer to protect the ferroelectric capacitor from hydrogen and moisture during the subsequent processing steps. Bailey, column 4, lines 18-22. This is the objective of Bailey's invention. Bailey, Title, Abstract, and column 4, lines 18-22. Therefore, because the TiO layer is needed to protect the ferroelectric capacitor from hydrogen and moisture during the subsequent processing steps, the person of ordinary skill in the art, having the advantage of the teachings of Bailey, would have no motivation to omit oxidation of the TiN layer to a TiO layer so that the upper layer could be deposited directly on the TiN layer.

The Office has not made the *prima facie* case. Arita does not show heat-treating a TiN layer before depositing an upper metal layer. As discussed above, neither this feature, nor deposition of an upper metal layer directly on a TiN layer is shown by Bailey. Thus, because these features are missing from the combination, the combination of Arita and Bailey in the manner proposed by the Office does not produce applicants' invention. The rejection of claims 11 and 16 to 21 as unpatentable over Arita and Bailey should be withdrawn.

Second Rejection under 35 USC 103

Claim 12 was rejected as unpatentable over Arita and Bailey and further in view of Wolf, Silicon Processing for the VLSI Era, Vol. 1, p. 367 (1986) ("Wolf"). This rejection is respectfully traversed.

As discussed above, combination of Arita and Bailey in the manner proposed by the Office does not produce the invention recited in claim 16. This deficiency is not overcome by Wolf, which discloses deposition of alloy films and wafer heating while sputtering.

The Office has not made the *prima facie* case. Therefore, the rejection of claim 12

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as unpatentable over Arita and Bailey and further in view of Wolf should be withdrawn. In addition, claim 12 is indirectly dependent on claim 16 and is allowable as a claim dependent on an allowable claim.

Third Rejection under 35 USC 103

Claims 5, 11, and 16 to 21 were rejected as unpatentable over Patel, U.S. Patent 5,374,578 ("Patel") and Bailey. This rejection is respectfully traversed.

The Office admits that Patel does not show heat-treating the TiN layer before depositing the upper Al layer. Office action of 7/18/03, page 4, lines 14-15.

According to the Office, referring to Figures 7 of Bailey, Bailey teaches heat-treating (anneal in step **838**) the Ti layer before depositing the upper Al layer. Office action of 7/18/03, page 4, lines 15-16.

As discussed above, Bailey discloses "TiN Oxidation RTA Anneal" so that the metal layer is deposited directly on a layer of TiO rather than on a layer of TiN, and a layer of TiO, rather than a layer of TiN, is annealed.

The Office has not made the *prima facie* case. Combination of Patel and Bailey in the manner proposed by the Office does not produce applicants' invention because heat-treating a TiN layer and depositing an upper metal layer directly on a TiN layer are missing from the combination. The rejection of claims 5, 11, and 16 to 21 as unpatentable over Patel and Bailey should be withdrawn.

Fourth Rejection under 35 USC 103

Claim 14 were rejected as unpatentable over Arita and Bailey and further in view of Wolf. This rejection is respectfully traversed.

As discussed above, combination of Arita and Bailey in the manner proposed by the Office does not produce the invention recited in claim 16. This deficiency is not overcome by Wolf, which discloses deposition of alloy films and wafer heating while sputtering. Therefore, the rejection of claim 14 as unpatentable over Arita in view of Wolf should be withdrawn. In addition, claim 14 is dependent on claim 16 and is allowable as a claim dependent on an allowable claim.

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Fifth Rejection under 35 USC 103

Claim 12 were rejected as unpatentable over Patel and Bailey and further in view of Wolf.

As discussed above, combination of Patel and Bailey in the manner proposed by the Office does not produce the invention recited in claim 16. This deficiency is not overcome by Wolf, which discloses deposition of alloy films and wafer heating while sputtering.

The Office has not made the *prima facie* case. Therefore, the rejection of claim 12 as unpatentable over Arita in view of Wolf should be withdrawn. In addition, claim 12 is indirectly dependent on claim 16 and is allowable as a claim dependent on an allowable claim.

Conclusion

It is respectfully submitted that the claims are in condition for immediate allowance and a notice to this effect is earnestly solicited. The Examiner is invited to phone applicants' attorney if it is believed that a telephonic or personal interview would expedite prosecution of the application.

Respectfully submitted,



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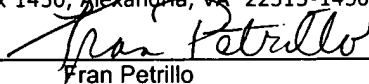
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October 20, 2003


Fran Petrillo